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DANGEROUS GOODS COMPLIANCE REPORT

ON PROPOSED

JUSTINIAN HOUSE REDEVELOPMENT

(Lot 1, DP802791)

FOR

ST VINCENT'S AND MATER HEALTH

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Background

St Vincent's and Mater Health proposes to redevelop the currently vacant Justinian House for use as premises for the Sydney Melanoma Unit. The main functions in the redevelopment will include consulting rooms, data base, laboratory, conference and auditorium facilities.

The purpose of this report is to identify compliance aspects of dangerous goods use in the new facility.

Dangerous goods usage will be limited to laboratory chemicals, standby generator fuel and boiler water treatment chemicals. For all classes of dangerous goods, inventories are well below the thresholds set out in SEPP33, so the proposed development is not classified as potentially hazardous or offensive.

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Executive Summary

The facility will use and store only very limited quantities of dangerous goods in three areas: a wet laboratory, generator fuel tank and boiler feed-water dosing system. None of the individual areas reach “placarding levels” as set out in the Occupational Health and Safety Regulation, so there are no specific requirements for signage, risk assessment documentation, formal emergency planning or Notification to WorkCover.

The inventory of each dangerous good falls within the Minor Storage provisions of the relevant Australian Standards. Safe operating procedures, incorporating the requirements of the Minor Storage rules, already exist in other premises and will be transferred to the new facility.

While the Occupational Health and Safety Regulation requires minimal control measures for these materials, in recognition of the extremely small inventories involved, it nevertheless requires a risk management approach to control of all chemical storages. An example of a documented risk assessment is attached. This example uses a matrix type structure generally in accordance with AS4360, the Australian Standard for risk management. The definitions used are attached as Appendix 1 and the risk assessment (for the nitrogen dewar) is attached as Appendix 2. This methodology for risk assessment is used elsewhere in St Vincent’s and Mater Health, and can be easily adapted to other situations.

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Recommendations:

1. It is recommended that the risk assessment (Appendix 2) be reviewed, modified as necessary and communicated to staff when the facility is commissioned.

2. The specification of the chemicals to be used in the boiler feed-water dosing will be finalized during design development. Typically, they are Class 8 corrosive liquids. It is probable that they will be handled by contractors rather than Sydney Melanoma Unit staff. Nevertheless, the "occupier" of the site is responsible for management of dangerous goods on the site. Therefore, it is recommended that suppliers be asked to provide copies of their Safe Work Procedures, so that due diligence can be demonstrated in this regard. Such procedures should cover emergency and spill management.

3. The specification of the fuel tank for the standby diesel generator is not yet finalised. The two main options are an underground tank or a fire-rated aboveground tank. The underground configuration is preferred for safety and space reasons, but it should be noted that the Department of Environment and Climate Change proposes to introduce legislation requiring very high standards of tank integrity and monitoring to prevent future soil contamination issues. Tanks systems designed to meet these requirements are commercially available.

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Classes of DG's to be stored:

1. Class 2.2 – liquid nitrogen, in one dewar of approximately 30 litres capacity.

2. Class 3 Packages – very small inventories of sterilizing or reagent solvents, typically denatured ethanol (includes sterile wipes saturated with ethanol preparations).

3. Class 6.2 – some materials of biological hazards will be generated within the facility.

4. Class 8 – very small inventories may be employed from time to time in the laboratory – some formalin (formaldehyde solution) will be used, but is diluted to the extent that it is no longer classified as a Class 8 corrosive liquid. Class 8 materials will be used in boiler water treatment, cleaning and pool treatment.

5. C1 Combustible Liquid - diesel fuel for the standby generator.

It is not proposed to store dangerous goods of Class 4 (reactive solids), Class 5 (oxidising), Class 6.1 (toxic), Class 7 (radioactive) or Class 9 (environmentally sensitive).

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Dangerous Goods Inventories

DG Class	Packing Group	Typical Inventory	Max Inventory	Typical Pack Size	Max Pack Size
2 - Cryo Liquids	N/A	15 litres	30 litres	30 litres	30 litres
3 - Flammable Liquids	II	2 litres	15 litres	1 litres	10 litres
8 - Corrosives	II	25 litres	25 litres	25 litres	25 litres
8 - Corrosives	III	50 litres	75 litres	25 litres	25 litres
C1 – Combustible Liquid	N/A	5000 litres	5200 litres	Bulk	N/A

Note: Packing Group refers to the degree of hazard, PG I representing greatest danger and PG III the least danger. No goods of PG I will be stored or used at Justinian.

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Legislation

The legislation covering the storage and handling of dangerous goods is contained in the

- Occupation Health and Safety Act 2000
- Occupational Health and Safety Regulation 2001
- Occupational Health and Safety Amendment (Dangerous Goods) Regulation 2005

These Regulations calls up a number of Australian Standards of which the following may be relevant to the proposed facility:

- AS1894-1997 Storage and handling of non-flammable cryogenic and refrigerated liquids
- AS1940-2004 The storage and handling of flammable and combustible liquids
- AS3780-1994 The storage and handling of corrosive substances
- AS/NZS2243 Safety in laboratories
- AS1692-2006 Steel tanks for flammable and combustible liquids

The Dangerous Goods Act does not cover Class 6.2 Infectious Substances (administered by the Department of Health) nor Class 7 Radioactive Substances (controlled by the EPA).

The Dangerous Goods Amendment of 2005 provides for a hierarchy of risk management control measures that are in proportion to the level of hazard. Further guidance is provided by WorkCover's "Storage and Handling of Dangerous Goods – Code of Practice 2005".

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DANGEROUS GOODS HANDLES OR STORED

Class 2.2 Cryogenic Liquefied Gases

Liquid nitrogen will be required in the laboratory area. This will be stored in a dewar of about 30 litres capacity. The relevant Australian Standard (AS1894) specifically excludes dewars of less than 50 litres capacity, but nevertheless offers useful guidance on safe storage.

The nitrogen will be gradually consumed due to evaporation and will be replaced, approximately weekly, by the gas manufacturer.

Issues associated with liquid nitrogen are summarized in the attached Dangerous Goods Risk Assessment (Appendix 2). No off site risks are identified.

Class 3 (Flammables)

There will be no requirement for any significant storage of Class 3 materials. Usage will be limited to small bottles of sterilizing solution (ethanol) and sterile wipes, typically gauze saturated with ethanol preparations. Note that some of these will then be treated and disposed of as clinical waste – refer separate Waste Management Report.

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Class 6 Toxic and Infectious Substances

Toxic materials of Class 6.1 will not be used, but some Class 6.2 materials will be, or could be, generated as waste. Class 6.2 Infectious Substances must be stored and handled in accordance with Department of Health requirements. These issues are covered under the heading of Clinical Waste in the Waste Management Report. It should be noted that Clinical Waste is not automatically classified as infectious, but the precautions for handing and storage are similar.

Class 8 Corrosives

The laboratory may use very limited quantities of corrosive materials, for example as glass cleaners. These are consumed by dilution and neutralization. The laboratory will also use formalin (formaldehyde solution), but at a dilution at which it is no longer classified as dangerous. However, fume cupboards have been provided to protect staff from its unpleasant odour. It is recommended that any other acids used in the laboratory are handled in these facilities.

The boiler feed-water will be treated using a mechanical dosing system. Such systems typically use corrosive materials for pH adjustment, and are usually handled by the boiler service contractor. The exact specification of the chemicals to be used will depend on the final design of the boilers and the condition of the

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water supply. Typical dosing chemicals are Class 8 corrosive liquids of Packing Group III.

Some cleaning chemicals used by cleaning staff may be classified as Class 8 corrosives, but inventories will be so small that no special storage arrangements are required.

C1 Combustible Liquid (Diesel)

The building will be equipped with a diesel powered generator for standby use. The generator will be located on the roof. Fuel for the generator will be stored in a storage tank of approximately 5000 litres capacity, from which it will be pumped to a day tank located adjacent to the generator. (Note that commercially available tank systems are typically either 2000 litres or 5000 litres capacity. This report assumes the larger capacity, as the worst case in terms of dangerous goods inventory. If the final specification of the generator indicates that 2000 litres is sufficient, then the reduced inventory is an advantage in terms of safety, investment and storage life of the fuel). Day tank capacity is typically of the order of 200 to 400 litres. The main storage tank can be located either underground or aboveground.

The advantage of an underground tank is primarily safety-related as the tank is protected from impacts and impinging fires. Another advantage is that it does not take up otherwise useful space. The Department of Environment and Climate Change (DECC) has announced the intention to enact legislation regarding

underground tanks. The following is an extract form the Department's website (http://www.environment.nsw.gov.au/clm/upss.htm) :

Proposed Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation

A new law is being proposed to apply to all underground petroleum storage systems (UPSS) in NSW. The proposed Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2007 (UPSS Regulation) focuses on a preventative approach to minimise the risk of soil and groundwater contamination from leaking UPSS. It also promotes the adoption of best industry practice in the design, installation, operation and management of UPSS. The new law will apply to anyone who is responsible for managing or controlling a UPSS.

Under the proposed UPSS Regulation, owners and operators of an UPSS will be required to have:

- a leak detection system;
- groundwater monitoring at sensitive locations;
- an Environmental Management Plan; and
- systems in place for record keeping, reporting of leaks, and notifying Council when a UPSS is decommissioned.

Commercially available tank systems include such features as double-walled tanks, with interstitial vacuum between the walls, which can be monitored easily by an in-built vacuum gauge. Groundwater monitoring wells are easily installed at the time of tank installation. With such hardware in place, the administrative requirements of the proposed Regulation are not too onerous.

Alternatively, an aboveground tank can be considered. Tanks are now commercially available which feature integral containment (ie double walled), fire rated construction and impact resistance. Such tanks can be installed inside a building, provided they are located on or below the lowest floor of the building. The disadvantage of such a tank is that it takes up space, and must be separated

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from “protected places”, either on or off site, by a distance, depending on the tank diameter and its capacity. For the type of tank considered here, three meters can be taken as a typical separation distance.

The fuel tank will be equipped with an outdoor fill point, consisting of a capped hose connection point (for the delivery road tanker), an isolation valve (if the tank is aboveground), and a drip catchment of 15 litres capacity. The location of the fill point will be arranged so that the tanker can leave the area without reversing. The fuel will be pumped from the bulk tank through a pipeline to the day tank by submersible pump. The day tank will be equipped with a return line, which acts as an overflow line so that it cannot be overfilled. The return line will also assist in the diesel reconditioning which may be required from time to time. Diesel reconditioning keeps the diesel in specification, especially in circumstances where it is likely to be in storage and unused for long periods of time, so that reliable start-up of the generator is assured when required. The return line allows the diesel fuel in the day tank to be recirculated and treated as required.

The tank, piping and fittings will be constructed and installed in accordance with AS1940 and AS1692.

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Waste Management

All of the dangerous goods listed above, except for Class 6.2, will be totally consumed and neutralized in use, so no dangerous wastes will be produced. Class 6.2 infectious waste will be generated on site. Disposal is covered, under the heading of Clinical Waste, in the Waste Management Report.

Fire Protection

The requirements set out in the relevant Australian Standards primarily involve the provision of first response fire extinguishers. These requirements are met by the building fire services and extinguishers provided.

Emergency Management

There is no specific requirement relating to emergency management of the small inventories of dangerous goods proposed. The building emergency plan should take note of the presence of such dangerous goods, especially in regard to escape routes. It is noted that the boiler chemicals will located in a dedicated area well away from normal or emergency access ways.

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Appendix 1 – Risk Assessment Definitions

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PREMIER

PREMIER RISK MANAGER DEFINITIONS

'L' = Likelihood		
How Likely?		**Description**
4	Almost Certain	**The event is very likely to occur at any time or the event has happened more than once in the past**
3	Likely	**The event will probably occur at some time or the event has happened in the past ("I've heard of it happening")**
2	Unlikely	**There is some chance that the event could occur but it is not expected to happen**
1	Rare	**Practically impossible for the event to occur or may only occur in exceptional circumstances**

'C' = Consequences		
Level		**If the event occurred, expected consequences could be:**
4	Severe / Catastrophic	• Death and/or permanent disability to one or more persons; and/or • Major off-site and/or on-site release and serious detrimental effects to environment; and/or • Major property damage and/or major disruption to activities and/or major financial costs expected.
3	Major	• Serious injury(s) to one or more persons – leading to time off work and/or work restrictions; and/or • Serious on- or off-site release requiring outside assistance for recovery, possible detriment to environment; and/or • Property Damage and/or disruption to activities and/or substantial financial costs expected.
2	Moderate	• Minor injury(s) to one or more persons which may result in outside medical treatment but does not lead to time away from work or any work restrictions; and/or • On-site release - contained or recovered with outside assistance • Minor property damage and/or some disruption to activities and/or some financial costs expected.
1	Minor / Insignificant	• No injury or First Aid treatment only – does not require any outside medical treatment and does not lead to time away from work or any work restrictions; and/or • No on-site release or minor on-site release contained immediately; and/or • Minor or no property damage and/or no disruption to activities and/or minimal financial costs expected. Nuisance and/or annoyance.

CONSEQUENCE definitions are colour coded to show the area of major impact (but overlaps are common):

- **Health and Safety**
- **Environmental**
- **Property Damage or Financial Costs or Disruption to Activities**

INHERENT RISK: The level of risk associated with an activity, circumstance or material when no control measures are in place.
RESIDUAL RISK: The level of risk remaining when the proposed Control Measures are in place.

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PREMIER

RISK RATINGS

Likelihood / Consequences		Almost Certain 4	Likely 3	Unlikely 2	Rare 1
Catastrophic	4	16	12	8	4
Major	3	12	9	6	3
Moderate	2	8	6	4	2
Minor	1	4	3	2	1

R = RISK = L (LIKELIHOOD) X C (CONSEQUENCE)

RED 16 to 8	High Risk	Unacceptable - Urgent action required. Report to Senior Management and implement corrective action plan immediately.
BLUE 6 to 4	Medium Risk	Determine relevant corrective actions and put in place as soon as possible.
GREEN 3 to 1	Low Risk	Do something where / when possible or manage by routine procedures. 'Low risk' does not mean 'no risk'.

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Appendix 2 – Dangerous Goods Risk Assessment – Nitrogen Dewar

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St Vincents & Mater Health Sydney

Hazard Identification, Risk Assessment & Control Record

Location	**Proposed Justinian House Redevelopment**	Plant Item / Operational Area:	**Liquid Nitrogen Storage in a dewar up to 50 litres capacity**	No:	N2
Area	Laboratory	Task Details	**Dangerous Goods Storage - including Particular Risk Control Measures (OHS Reg 174R-174AA)**		
Prepared By:	BC - Draft only			Date	10/10/2007
Review Date:	Review at commissioning	Reviewed By:		Date:	

NO.	ACTIVITY OR CIRCUMSTANCE	POTENTIAL SAFETY HAZARD OR ENVIRONMENTAL ASPECT	INHERENT RISK			CONTROL MEASURE	RESIDUAL RISK		
			L	C	R		L	C	R
1	Inventory reduction or substitution? (Application of hierarchy of controls)	Minimising inventory often minimises risk. Ensures safer alternatives are considered where appropriate.				Nitrogen is the safest gas for this purpose. Only one dewar is used and is less than 50 litres capacity.			
2	Stability	No issues found	1	1	1	Product is stable - refer MSDS.	1	1	1
3	Separation from other DG storages	Interaction with other dangerous goods, or knock-on effects from emergencies involving other dangerous goods, eg fire causing loss of containment	2	3	6	Other dangerous goods are kept away from dewars. No significant adjacent fire loads, such as accumulations of combustible materials. Nitrogen is inerting so will not contribute to a fire.	1	1	1
4	Separation from water	Heating, spitting, intense boiling if water, or anything else warmer than the nitrogen, enters the liquid phase.	1	3	3	Design of containers, training of operators. Special care required if water is used to unfreeze fittings.	1	2	2

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5	Separation from boundaries	Fumes or spill off site	2	1	2	Usually located well away from boundaries and areas of public access. Evaporated nitrogen has no adverse impact off site.	1	1	1
6	Interaction with other dangerous goods	Violent boiling if warmer materials are introduced.	2	2	4	No other dangerous goods are introduced into the dewars.	1	2	2
7	Ignition sources	Adjacent fire could cause violent boiling or loss of containment	1	4	4	Ignition only relevant when flammables or combustibles present, and these are minimised.	1	1	1
8	Ventilation and atmospheric emissions	See below re oxygen depletion. Possibility of vented nitrogen re-entering building via ducts or intakes	2	4	8	Always store dewar in well-ventilated areas. Do not store in cupboards, offices, small rooms or areas of poor ventilation.	1	2	2
9	Contamination of food and personal products	Not an issue with nitrogen.	1	1	1	No issues identified. In any case, eating is not permitted in areas where dewar is stored.	1	1	1
10	Construction of containers	Vessel leak or catastrophic failure	2	3	6	Only containers specifically designed for liquid nitrogen are used. (Ordinary vacuum flasks must never be used). This assessment applies only to dewars which free vent and therefore contain no pressure.	1	2	2
11	Impact damage	Catastrophic loss of containment	2	4	8	Dewar is stored away from access areas, out of the way of passing traffic. Dewar is always located on a sturdy surface.	1	2	2

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12	Containment of spills	Potential environmental damage and personnel exposure. Oxygen depletion, embrittlement of equipment, frostbite	1	4	4	Evacuate area. Dissipation by ventilation is correct method of spill management. PPE required.	1	2	2
13	Overpressure	Explosion potential due to large volumetric expansion when liquid nitrogen boils. Eg if liquid nitrogen leaks into sample vials, the vials can explode when removed to ambient conditions	2	4	8	Use only vials and other equipment which is specially designed for liquid nitrogen service.	1	2	2
14	Transfer - leak during filling of dewar	Personnel exposure and / or loss of containment.	2	4	8	Transfers are to occur outdoors (some gas suppliers have this facility on the delivery vehicles). Transfers are done by trained personnel only.	1	3	3
15	Transport of dewars, including transport in lift	Spill, oxygen depletion especially in lift	2	4	8	No personnel are to accompany any nitrogen container in a passenger lift. Use lock out system or after hours arrangements. Use trolleys provided by dewar manufacturer for transport between rooms.	1	3	3
16	Introduction of incompatible material	Violent reaction, loss of containment, personnel exposure to splashing, boiling	2	3	6	Correct labelling, security access arrangements (so unlikely entry by untrained personnel).	1	2	2

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17	Fire protection	Loss of containment	1	2	2	Refer Emergency Plan. Fire facilities designed to extinguish adjacent fires and keep dewar cool if necessary.	1	2	2
18	Emergency planning	Asphyxiation, spill, chemical burn to personnel.	2	2	4	Refer Emergency Plan. Evacuate area and raise the alarm. Do not attempt rescue of unconscious personnel unless equipped and trained to do so.	1	2	2
22	Cleanliness	Nitrogen can become oxygen enriched leading to increased hazards if combustibles such as oil and grease are present	1	2	2	Use only equipment designed for liquid nitrogen service. Keep all other substances and objects away from the dewar.	1	1	1
23	Embrittlement	Some materials become brittle when exposed to very low temperatures	2	2	4	Use only equipment designed for liquid nitrogen service.	1	2	2
25	Control of entry	Access by unauthorised persons, probably unaware of the hazards	1	4	4	Persons other than employees are accompanied at all times and are made aware of the hazards. Signs prohibit unauthorised entry.	1	1	1
26	Clear access	Poor access to escape routes, fire fighting equipment or safety equipment, leading to delay in escape or delay in response	1	3	3	Dewar is stored away form access paths.	1	2	2
27	Operational safety and training	Untrained personnel unaware of the hazards. Ditto maintenance personnel and contractors	2	3	6	All personnel trained in hazards and use of liquid nitrogen. Generally no requirement for contractors to handle dewars. Dewars to be removed if they interfere with maintenance activities.	1	2	2

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28	Personal protective equipment and first aid	Equipment to prevent freeze burns	1	3	3	PPE provided, but CAUTION: Some PPE such as gloves and shoes can trap nitrogen and intensify injuries. Clothing and PPE should protect from contact with liquid nitrogen. First aid and hospital facilities available.	1	2	2
29	Impact of other processes in nearby areas	Heat generation, vibration, mechanical damage from adjacent processes	2	3	6	Dewar to be kept away from situations which could impact on it.	1	2	2

Code of Practice: AS1894 The storage and handling of non-flammable cryogenic and refrigerated liquids
Note: AS1894 specifically excludes dewars of less than 50 litres capacity form its scope, but nevertheless offers useful guidance.
If dewars of greater than 50 litres capacity are contemplated, reference must be made to the ventilation requirements of AS1894